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- (54) **AIR REGISTER**
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D23/392
See application file for complete search history.

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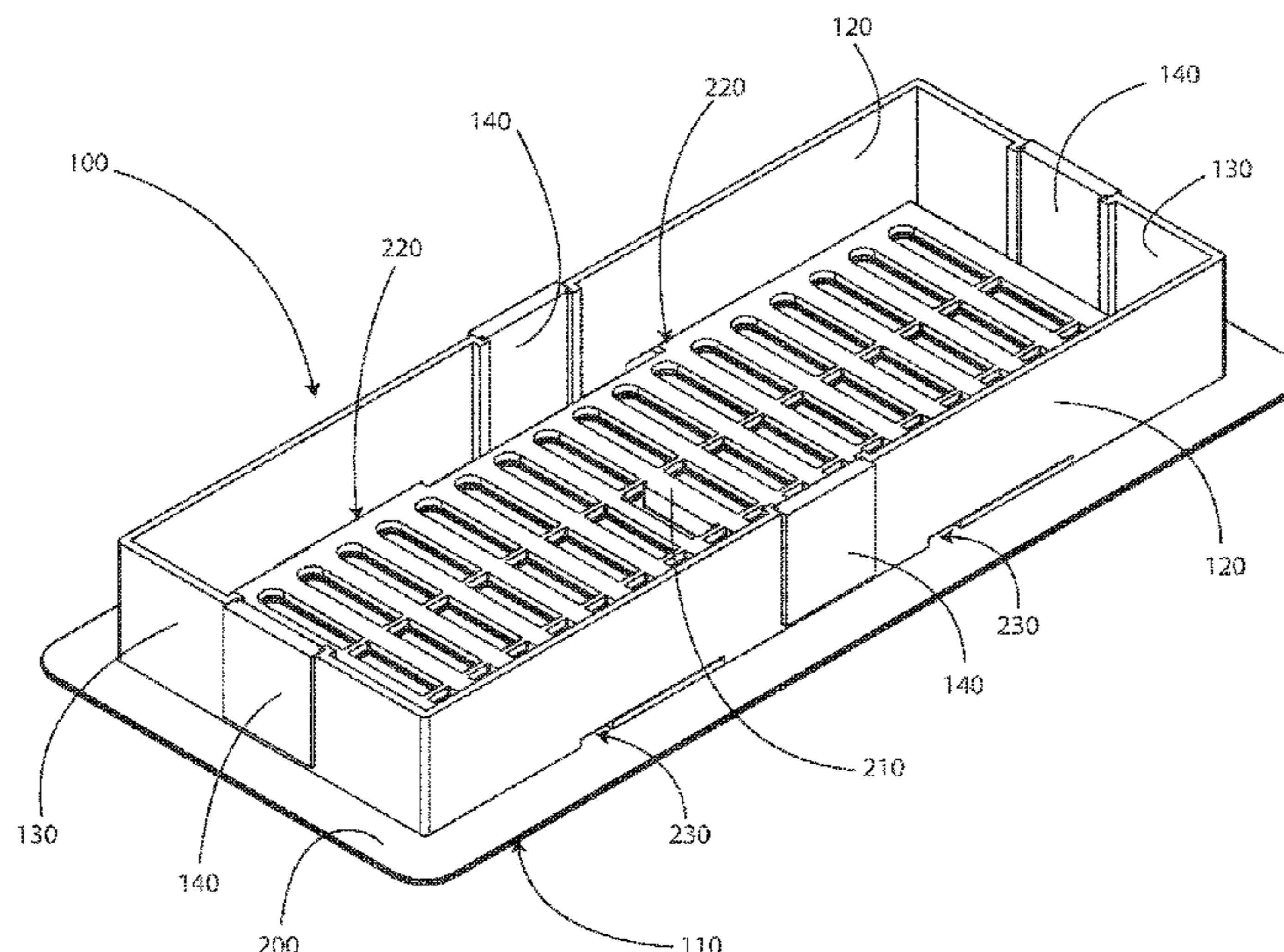
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(57) **ABSTRACT**

An air register includes a grating, a frame, and magnets. The frame has side and end walls and is sized to fit in a register boot. The walls extend substantially orthogonally from a rear face of the grating. The magnets are disposed substantially flush with an outside face of each of the walls for magnetically retaining the air register in register boots at least partially formed of one or more magnetic materials.

18 Claims, 3 Drawing Sheets



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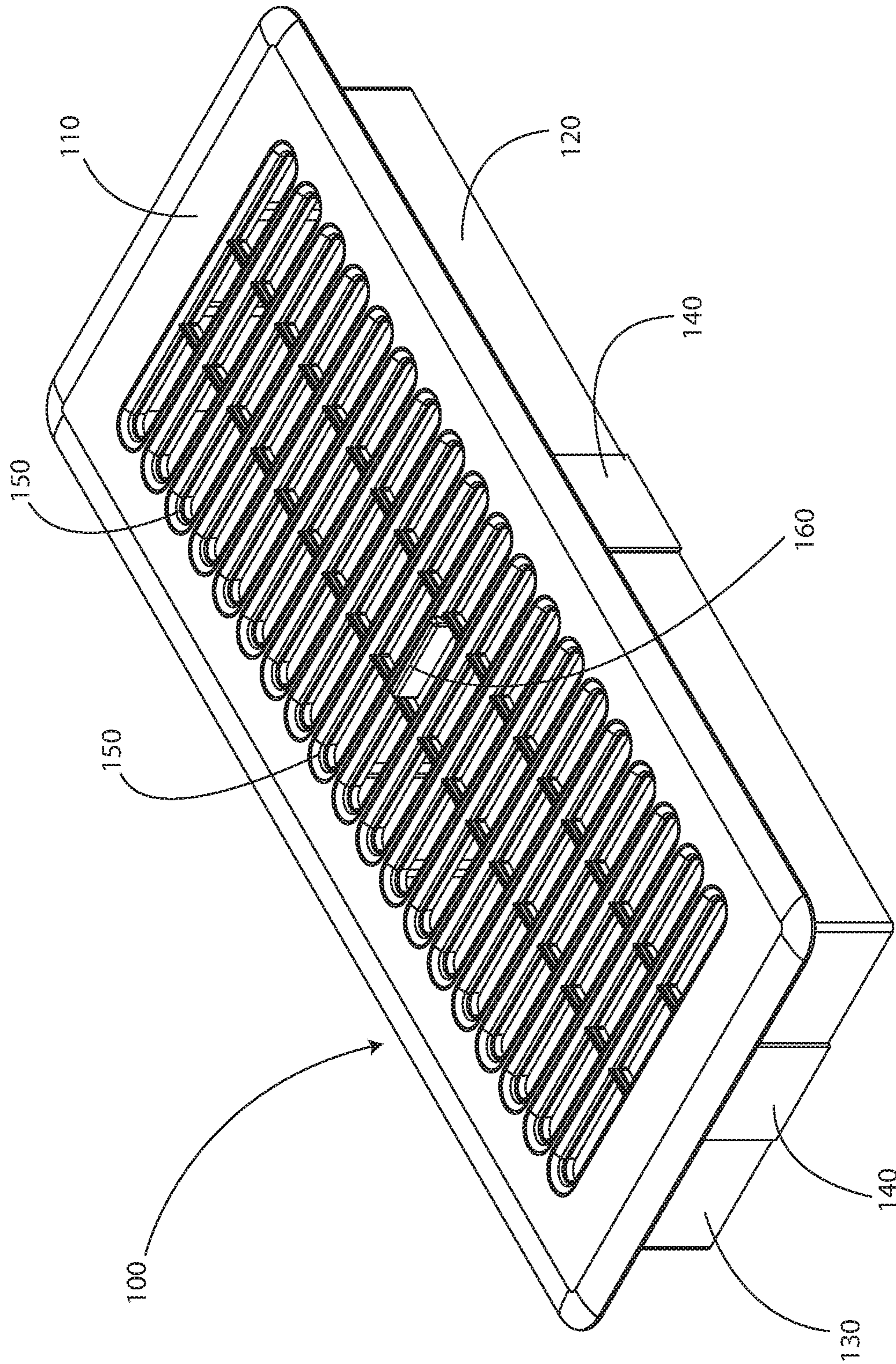


FIG 1

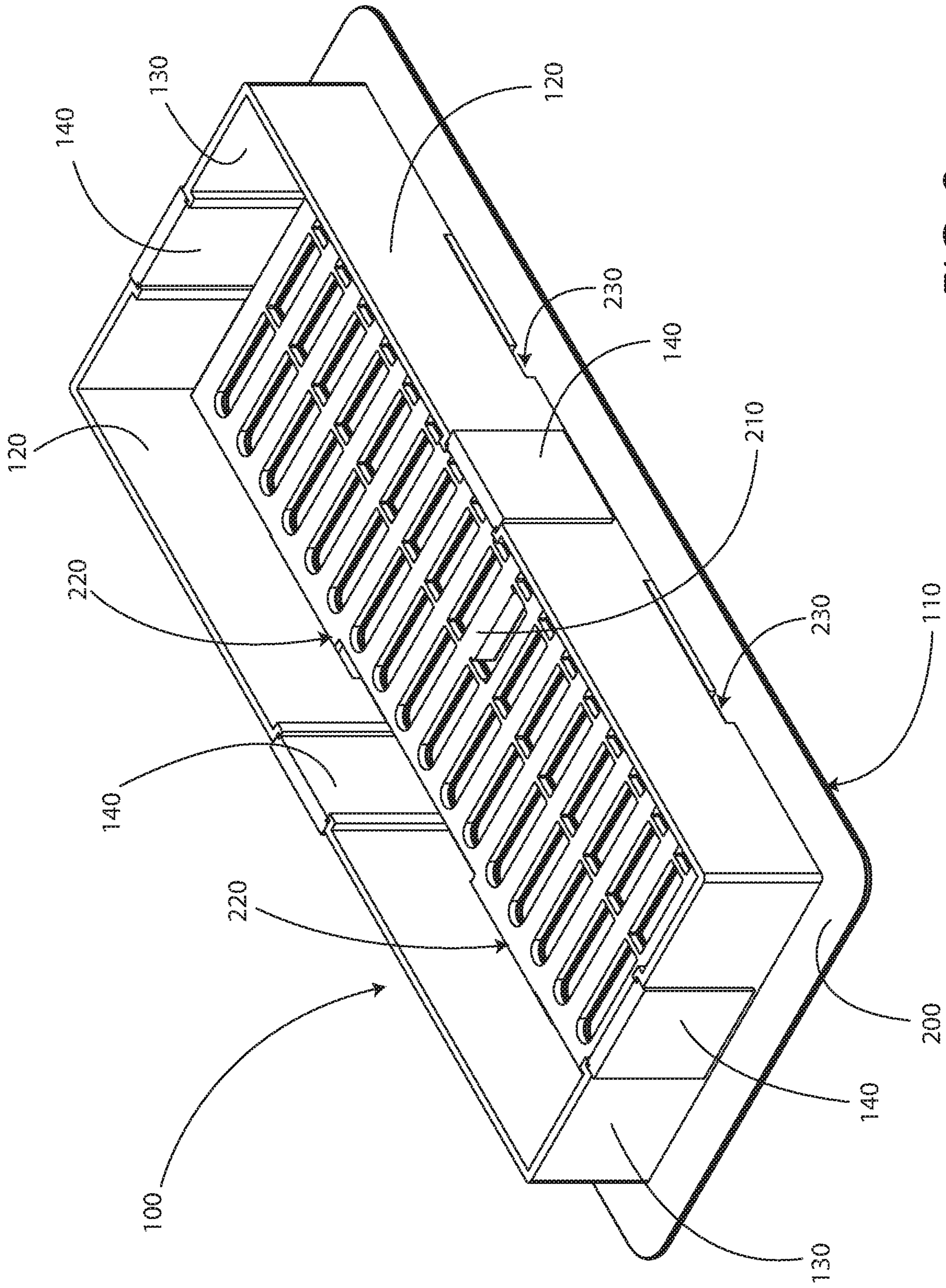


FIG 2

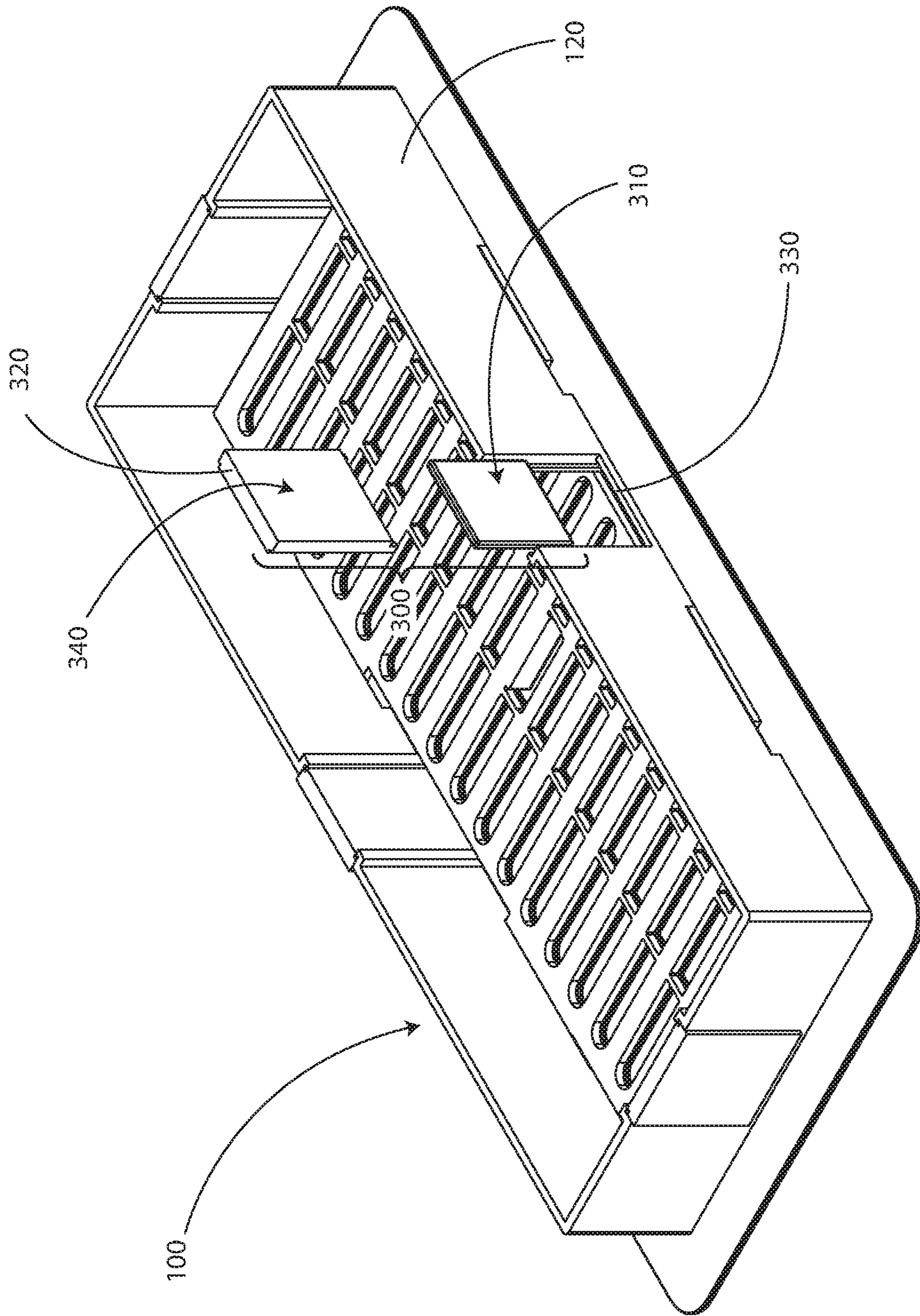


FIG 3

1**AIR REGISTER**

RELATED APPLICATIONS

This application claims the benefit of priority from U.S. Provisional Application No. 62/553,964, filed on Sep. 4, 2017, the contents of which are herein incorporated by reference in their entirety.

FIELD

This application relates to heating, ventilating, and/or cooling (HVAC) systems and, more particularly, to air registers.

BACKGROUND

HVAC systems may distribute air by way of ducts. Air channeled by ducts may be distributed into rooms and other spaces by way of registers.

A duct system may include one or more register boots, which are also referred to as duct boots. Register boots allow ducts such, as for circular ducts, to be channeled to a register. Register boots provide an outlet, which is often rectangular in shape, into which a register can be inserted. Register boots may be formed of a variety of materials and may be formed using various techniques. In one example, register boots may be made of sheet metal and may be formed using one or more well-known metal working techniques. In another example, register boots may be made of plastic and may be formed, for example, using injection molding.

Air registers, which may also be referred to as registers, vents, vent covers, or register covers, include gratings that allow air to pass out of a duct (through the register boot) into a room or other space. The gratings of air registers may also provide the benefit of preventing or limiting the ability of foreign objects to enter into ducts.

In some cases, it may be necessary to secure air registers in place. For example, because of the action of gravity, registers inserted into register boots venting through, for example, a wall or ceiling may need to be secured against tilting or falling. Additionally or alternatively, air registers may be secured to prevent tampering such as, for example, by children. Registers are often secured using screws that screw into an adjacent wall, ceiling, or floor through screw holes in a lip of the register. Such screws may however, pull out over time such as, for example, when a wall or ceiling is formed of drywall, especially if there is no framing behind the wall in the area of the screw and appropriate anchors are not used. Further, because it may be necessary to remove air registers periodically such as, for example, to allow ducts to be cleaned, such screw holes may become stripped through repeated removal and insertion of the screws even if the hole is partly in framing or an anchor is employed. Additionally, inserting and removing screws may be cumbersome and could result in increased costs for register installation and/or removal such as, for example, during construction and/or cleaning.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments are described in detail below, with reference to the following drawings:

FIG. 1 is a perspective view of an example air register according to the present application.

FIG. 2 is a further perspective view of the air register of FIG. 1 showing the rear face of the grating of the air register.

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FIG. 3 is an exploded perspective view of the air register of FIG. 1.

Like reference numerals are used in the drawings to denote like elements and features.

DETAILED DESCRIPTION

In one aspect, there is provided an air register including a grating, a frame, and magnets. The frame has side and end walls and is sized to fit in a register boot. The walls extend substantially orthogonally from a rear face of the grating. The magnets are disposed substantially flush with an outside face of each of the walls for magnetically retaining the air register in register boots at least partially formed of one or more magnetic materials.

Conveniently, such an air register may be magnetically retained in a register boot formed of a magnetic material.

Other aspects and features of the present application will be understood by those of ordinary skill in the art from a review of the following description in conjunction with the accompanying figures.

FIG. 1 is perspective view of an air register **100** according to the present application.

As illustrated, air register **100** includes a grating **110**, walls—in particular, side walls **120** and end walls **130**—and magnets **140**.

FIG. 1 shows a front face of the grating **110**. FIG. 2 is a corresponding perspective view of the air register **100** showing a rear face of the grating **110**.

As illustrated, the grating **110** includes openings **150** through which air may flow through the air register **100** into a space such as, for example, a room.

As best shown in FIG. 2, the side walls **120** and the end walls **130** extend substantially orthogonally from the rear face of the grating **110**. The side walls **120** and the end walls **130** cooperate to define a substantially rectangular frame. The frame may be sized to fit into a register boot. For example, the frame may be sized to fit a register boot having a four-by-ten-inch opening.

In some embodiments, one or more of the side walls **120** may, as shown, meet one or both of the end walls **130** at respective corners of the frame. Alternatively, there may be a gap between one or more of the side walls **120** and one or both of the end walls **130** such that the frame is not fully enclosed by a single wall.

As illustrated, magnets **140** are disposed along outside faces of the side walls **120** and the end walls **130**. Each of the magnets **140** may be fixedly positioned relative to the walls. The magnets **140** may, as illustrated, be substantially flush with the outside face of the side walls **120** and the end walls **130**. Conveniently, in this way, the opening for air flow through the frame may be maximized while still having the air register **100** fit into a particular size of register boot as compared to if one or more of the magnets **140** protruded from an outside face of the walls. The magnets **140** being substantially flush with the outside face of the side walls **120** and the end walls **130** may also prevent or limit damage to the magnets **140** during handling of the air register **100** such as, for example, chipping of the magnets **140**. Additionally or alternatively, the magnets **140** may, as illustrated, be substantially flush with the inside face of the side walls **120** and the end walls **130**. Conveniently, in this way, protrusions into the frame may be avoided. Avoiding protrusions into the frame may limit obstruction or diversion of air flow there-through.

In some embodiments, there may be, as illustrated, a single one of the magnets **140** corresponding to each one of

the side walls **120** and the end walls **130**. Those magnets may, for example, be centrally-positioned—e.g., in the middle of—a respective one of the side walls **120** or the end walls **130** as shown. Alternatively, more than one of the magnets **140** may be disposed along a particular one or more of the side walls **120** and/or the end walls **130**. For example, one of the side walls **120** could include more than one magnet. In a particular example, magnets may be spaced evenly along a particular one (or ones) of the side walls **120** and/or the end walls **130** that include more than one of the magnets **140**.

In some embodiments, those of the magnets **140** disposed along a particular one of the walls of the frame may, as illustrated, be positioned in opposition to those other of the magnets **140** disposed along an opposite one of the walls of the frame. For example, as shown, the one of the magnets **140** disposed along one of the side walls **120** is opposite the other of the magnets **140** disposed along the other of the side walls **120** and similarly so for the end walls **130**. Conveniently, positioning magnets so opposed may serve to limit or prevent twisting or shifting of the air register **100** in a register boot due to the opposing nature of the magnetic attraction of each the opposed magnets to a respective adjacent wall of a magnetic register boot as compared to the magnetic forces stemming from the magnet opposite that magnet.

The magnets **140** may be sized and positioned so as to not substantially extend into an interior of the frame defined by the side walls **120** and the end walls **130**. Conveniently, in this way, obstruction by the magnets **140** of the air flow through the frame may be limited.

The magnets **140** may, as illustrated, be rectangular magnets. Additionally or alternatively, the magnets **140** may include one or more magnets of other shapes (not shown).

One or more of the magnets **140** may act to magnetically retain the air register **100** in a register boot formed of a magnetic material. For example, one or more of the magnets **140** may act to magnetically retain the air register **100** in a register boot formed of a ferromagnetic material. In a particular example, one or more of the magnets **140** may act to magnetically retain the air register **100** in a register boot made of galvanized steel.

The magnets **140** are selected to provide sufficient magnetic force for retaining the air register **100** in the opening of a register boot. For example, where the air register **100** is a ceiling register, the magnets **140** may be selected to provide sufficient magnetic force for retaining the air register **100** against the pull of gravity. Additionally or alternatively, the magnets **140** may be selected to retain the air register **100** in place against the force of blowing air such as, for example, when a damper (further described below) of the air register **100** is closed, thereby limiting or even blocking the flow of air through the openings **150**. Conveniently, in this way rattling of the air register **100** due to air flow such as, for example, rattling of one or more of the side walls **120** and/or the end walls **130** against a register boot, may be limited. Additionally or alternatively, expulsion of the air register **100** from a register boot due to air flow may be prevented. For example, it may be that the magnetic force provided by the magnets **140** acts to oppose the air register **100** being expelled from a register boot due to air flow when the above-mentioned damper is closed. Another consideration in the selection of the magnets **140** may, for example, be that the force required for removing the air register **100** from a register boot—i.e., by overcoming the magnetic force—should not be so much as to make removal difficult for an ordinary adult. Additionally or alternatively, it may be

a consideration in the selection of the magnets **140** that sufficient force for removing the air register **100** from a register boot should be required that a child could not easily remove the air register **100** such as, for example, from a floor opening. In some embodiments, one or more of the magnets **140** may be rare-earth magnets such as, for example, neodymium magnets.

Each of the magnets **140** may magnetically engage with a wall of the opening of a magnetic register boot so as to magnetically retain the air register **100** in the register boot. In some cases, however, register boots may only be nominally of their defined size and dimensions or features thereof such as, for example, opening sizes, may vary from register boot to register boot. For example, it may be that the tolerances in forming a register out of sheet metal are sufficiently loose that one or more of magnets **140** may, when the air register is inserted into a register boot, be spaced apart from a wall of the register boot so as to not touch it. Such a gap may, due to the distance between such a magnetic wall and the corresponding one or more of the magnets **140**, lessen the attractive force between those ones of the magnets **140** and the register boot. A lessened attractive force may reduce or limit the magnetic force retaining the air register **100** in the register boot. Accordingly, the magnets **140** may be selected so as to allow sufficient magnetic force to be provided for magnetically retaining the air register **100** in the opening of the register boot even if only a subset of the magnets touch and/or substantially engage magnetically with walls of a register boot opening. For example, the magnets **140** may be selected so that only the magnets in one of the end walls **130** and one of the side walls **120** are required to touch or substantially engage magnetically with corresponding sides of a register boot in order to magnetically retain the air register **100** in the register boot.

As illustrated, each of the end walls **130** and the side walls **120** has an outer edge along the part of the wall furthest from the rear face of the grating **110**. One or more of the magnets **140** may extend to such an outer edge of a corresponding one of the walls. Conveniently, magnets so extending may be easier to engage magnetically with a register boot such as, for example, if the register boot is set back somewhat from the surface of the wall, ceiling, or floor (as the case may be). Additionally, it may be that one or more of the magnets **140** spans along the height of the corresponding one of the walls from the outer edge of the wall to the base of the wall—i.e., at the rear face of the grating **110**.

In some embodiments, the air register **100** may include a lip **200** (FIG. 2). The lip **200** may allow the air register **100** to be pried or pulled from a register boot. Additionally or alternatively, the lip **200** may prevent the air register **100** being too deeply inserted into a register boot such that it may be difficult to retrieve, such as, for example, if a floor register is pushed or stepped on. It may be that the air register **100** is difficult to remove if too deeply inserted into a register boot because of the need to overcome magnetic retention. Additionally or alternatively, the lip **200** may act to hide an unfinished edge of either the wall/floor/ceiling surface adjacent the boot or and/or a gap between the adjacent surface and the boot.

As mentioned above, the air register **100** may, as illustrated, include a damper **210** (FIG. 2). The damper **210** may be operated using a handle **160** (FIG. 1) so as to open or obstruct the openings **150**.

The damper **210** may, as shown, be formed as another grating. The damper **210** may include one or more fins **220** (FIG. 2) that fit in channels **230** defined between the side

walls **120** and the grating **110** and act to retain the damper **210** in a position proximate to or up against the grating **110**. In some embodiments, the fins **220** may slide back and forth in respective ones of the channels **230** as the damper **210** is operated using the handle **160**. Conveniently, such a damper mechanism may be easy to manufacture due to a small part count. Additionally or alternatively, such a damper mechanism may be easy to assemble with the air register **100** by displacement or snap fitting the damper **210** into the channels **230**.

In some embodiments, the damper **210** may take other forms such as, for example, one or more louvres (not shown) such as may, for example, be operated by rotating or sliding a suitable variant of the handle **160**.

In some embodiments, the magnets **140** may also act to secure the air register **100** from shifting during operation of a damper **210**.

In some embodiments, one or more of the magnets **140** may include a cover. FIG. **3** is an exploded perspective view of the air register **100** showing components of one of the magnets **140**, namely a magnet **300**, including such a cover.

As illustrated, the magnet **300** includes a magnet element **310** and a cover **320**. The magnet **300** is received in a slot **330** in one of the walls of the frame of the air register **100**, namely in one of the side walls **120**.

In some embodiments, one or more covers akin to the cover **320** may be provided, each of the covers covering a corresponding one of the magnets along at least the outside face of the outside face of wall of the frame—i.e., of side walls **120** and/or end walls **130**.

The magnetic element **310** may, as illustrated, be a rectangular bar magnet. Alternatively, the magnetic element **310** may have another shape. In some embodiments, a non-rectangular magnetic element that is a non-rectangular may be adapted to fit in a slot by a suitably-shaped cover. For example, a suitable cover may adapt a non-rectangular magnet to fit in a rectangular slot. The magnetic element **310** is a permanent magnet. For example, the magnetic element **310** may be a rare-earth magnet such as, for example, a neodymium magnet.

The cover **320** acts to protect the magnetic element **310** from the environment and from damage such as, for example, during handling of the air register **100**. In a particular example, the cover **320** may protect the magnetic element **310** from damage during insertion of the air register **100** into or removal of the air register **100** from a register boot. For example, the magnetic element **310** may have a protective coating such as, for example, zinc, chrome, or nickel plating that could be damaged or worn during handling or the air register **100**. Such a coating may act to protect the magnet against the environment and damage such as, for example, due to corrosion and/or oxidation. For example, an uncoated neodymium magnet or one with a compromised or damaged coating may be damaged by oxidation. Conveniently, the cover **320** may protect a coating on the magnetic element **310** so as to prevent or limit wear or damage thereto.

The cover **320** may cover all or a portion of the magnetic element **310**. For example, the cover **320** may cover the magnetic element **310** of magnet **300** along at least the outside face of the wall—e.g., the outside face of one of the side walls **120**. Conveniently, covering the outside face of the wall may provide one or all of the above-described benefits against wear or damage to the magnet **300** such as, for example, during insertion and/or removal of the air register **100** to/from a register boot.

The cover **320** may be formed of the same material as the side wall **120** or as other parts of the air register **100** such as, for example, the same as one or more of the end walls **130** or the grating **110**.

The cover **320** may be formed of a plastic such as, for example, polystyrene.

In some embodiments, the cover **320** may be formed of an elastomeric material. For example, the cover **320** may be formed of silicone. In a particular example, a silicone film may be employed such as, for example, a silicone film having a durometer of about Shore **40A**. Forming the cover **320** of an elastomeric material may provide a friction fit between the magnet **300**, the cover **320**, and the slot **330** so as to retain the magnet in the slot **330**. Additionally or alternatively, a cover **320** formed of an elastomeric material may allow looser manufacturing tolerances for one or both of the magnet **300** and the slot **330** as such a cover may distort to provide a suitably tight fit between the magnet **300**, the cover **320**, and the slot **330** despite minor variances in component dimensions.

In addition or as an alternative to a friction fit between one or more of the magnet **300**, the cover **320**, and the slot **330**, a suitable adhesive that is compatible with the relevant materials may be employed. For example, in some embodiments, a suitable epoxy resin may be employed.

A cover **320** formed of an elastomeric material may have an outside surface **340** of the cover **320** that acts as a bearing surface for frictionally retaining the air register **100** in a register boot. Such a frictional retention may co-operate with a magnetic retention by way of one or more of the magnets **140** to enhance the retention of the air register **100** in a magnetic register boot. Additionally, such a combination of frictional and magnetic retention may allow the air register to be retained in a register boot that is only partially magnetic such as, for example, a register boot that is only partially magnetic. In another example, frictional retention alone such as, for example, by way of the cover **320**, may suffice to retain the air register **100** in a register boot formed of a non-magnetic material such as, for example, plastic. Plastic register boots may be manufactured to tighter manufacturing tolerances and/or may warp or distort less during use as compared to sheet metal register boots. Conveniently, a register boot having a tighter manufacturing tolerance may enhance the ability of the air register **100** to be retained therein using only frictional retention. Where the air register **100** is a ceiling register frictionally retained in a register boot, the frictional retention may resist the pull of gravity on the air register **100**. Additionally or alternatively, frictional retention of the air register **100** in a register boot may resist rattling in and/or expulsion from the register boot such, for example, due to flowing air. Additionally or alternatively, frictional retention of the air register **100** in a register boot may prevent or limit the ability of a child to easily remove the air register **100** such as, for example, from a floor opening.

In some embodiments, the air register **100** may include patches or areas formed of a resilient material on the outside of one or more of the side walls **120** and/or the end walls **130**—i.e., other than resilient material acting as a cover for one or more of the magnets **140**—that act as bearing surfaces to further enhance frictional retention.

In some embodiments, one or more of the magnets **140** may be retained in a slot akin to the slot **330** without the use of a cover. Such a magnet may be retained in such a slot by friction fit between the magnet and the slot and/or by way of a suitable adhesive. For example, an epoxy resin may be employed.

One or more of the side walls **120**, the end walls **130**, and the grating **110** may be formed all or in part using lightweight materials. For example, a suitable plastic may be employed. In other words, one or more of the frame and the grating **110** may be formed of plastic. In a particular example, the plastic may be polystyrene. Plastic components may be formed using suitable molding techniques. For example, it may be that injection molding and/or blow molding is employed. Conveniently, forming one or more of the side walls **120**, the end walls **130**, and the grating **110** of lightweight materials may reduce the magnetic force necessary for retaining the air register **100**. A reduced magnetic force necessary for retaining the air register **100** may reduce the strength of magnets **140** required. Conveniently, less strong magnets may be more inexpensive than stronger magnets. In some embodiments, one or more of the side walls **120**, the end walls **130**, and the grating **110** may be formed together as a monolithic component.

Conveniently, an air register according to the present application may be retained in a magnetic register boot without the use of fasteners such as, for example, screws. Accordingly, the air register **100** may, as illustrated, not contain any screw holes. Additionally or alternatively, an air register according to the present application may be frictionally retained in a wholly or partially non-magnetic register boot and may, therefore, also omit screw holes.

In the present application, the term “and/or” is intended to cover all possible combinations and sub-combinations of the listed elements, including any one of the listed elements alone, any sub-combination, or all of the elements, and without necessarily excluding additional elements.

In the present application, the phrase “at least one of . . . or . . .” is intended to cover any one or more of the listed elements, including any one of the listed elements alone, any sub-combination, or all of the elements, without necessarily excluding any additional elements, and without necessarily requiring all of the elements.

As noted, certain adaptations and modifications of the described embodiments can be made. Therefore, the above-discussed embodiments are considered to be illustrative and not restrictive.

What is claimed is:

1. An air register comprising:

a grating;

a frame having side and end walls and sized to fit in a register boot, the walls extending substantially orthogonally from a rear face of the grating, the frame defining a plurality of slots; and

a plurality of magnets for magnetically retaining the air register in register boots at least partially formed of one or more magnetic materials, wherein each of the mag-

nets is directly fixed within a respective one of the slots and fixedly positioned relative to the walls.

2. The air register of claim **1**, wherein each of the walls has a single corresponding one of the magnets.

3. The air register of claim **2**, wherein each of the magnets is centrally-positioned on a respective one of the walls.

4. The air register of claim **1**, wherein each of the walls has an outer edge furthest from the rear face of the grating, and wherein at least one of the magnets extends to an outer edge of a corresponding one of the walls.

5. The air register of claim **4**, wherein the at least one of the magnets spans from the rear face of the grating to the outer edge of the corresponding one of the walls.

6. The air register of claim **1**, further comprising one or more covers formed of an elastomeric material, each of the one or more covers covering a corresponding one of the magnets along at least the outside face of at least one of the walls.

7. The air register of claim **1**, wherein at least a portion of the outside face of each of the walls includes a bearing surface formed of an elastomeric material for frictionally retaining the air register in register boots.

8. The air register of claim **1**, wherein the magnets are rare-earth magnets.

9. The air register of claim **8**, wherein at least one of the rare-earth magnets is a neodymium magnet.

10. The air register of claim **1**, wherein at least one of the magnets is retained in a respective one of the slots in a respective one of the walls.

11. The air register of claim **10**, wherein the at least one of the magnets is retained in its respective slot using an adhesive.

12. The air register of claim **10**, wherein the at least one of the magnets is retained in its respective slot by a friction fit between that magnet, the respective slot, and a cover disposed between the magnet and the respective slot.

13. The air register of claim **12**, wherein the cover is formed of an elastomeric material.

14. The air register of claim **12**, wherein the cover extends to cover the magnet along the outside face of the respective one of the walls.

15. The air register of claim **1**, wherein the air register does not contain any screw holes.

16. The air register of claim **1**, wherein the magnets are rectangular.

17. The air register of claim **1**, wherein the frame and the grating are formed of plastic.

18. The air register of claim **17**, wherein the plastic is polystyrene.

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